

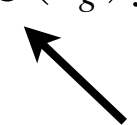
Scene Modeling Photometry

- ▶ Holtzman et al. (2008)
- ▶ Default PHOTO processing produces “corrected” frames (fpC files). Bias-subtracted, flat-fielded, astrometry, bad pixel flags, determine PSF.
- ▶ Uses the Ivezić et al. (2007) star catalog for relative photometric calibration. Determine zeropoints of each frame. Scatter around the best fit provides photometry uncertainty floor.
- ▶ Apply absolute flux calibration refinement (AB offsets) derived from white dwarfs and solar analogs.

Flux extraction technique

- ▶ No resampling of images. No PSF degradation.
- ▶ Take 2048x1024 pixel section centered on the SN candidate.
- ▶ Determine background in 25 subsections (5x5) and fit a slowly-varying function.
- ▶ Determine spatially-varying PSF using DAOPHOT.
- ▶ Model the calibration stars and SN+galaxy as:

$$M(x, y) = \text{sky}(x, y) + S \left(\sum_{\text{stars}} I_{\text{star}} \text{PSF}(x - x_{\text{star}}, y - y_{\text{star}}) + I_{\text{SN}} \text{PSF}(x - x_{\text{SN}}, y - y_{\text{SN}}) + \sum_{x_g, y_g} \mathcal{G}(x_g, y_g) \text{PSF}(x - x_g, y - y_g) \right), \quad (1)$$

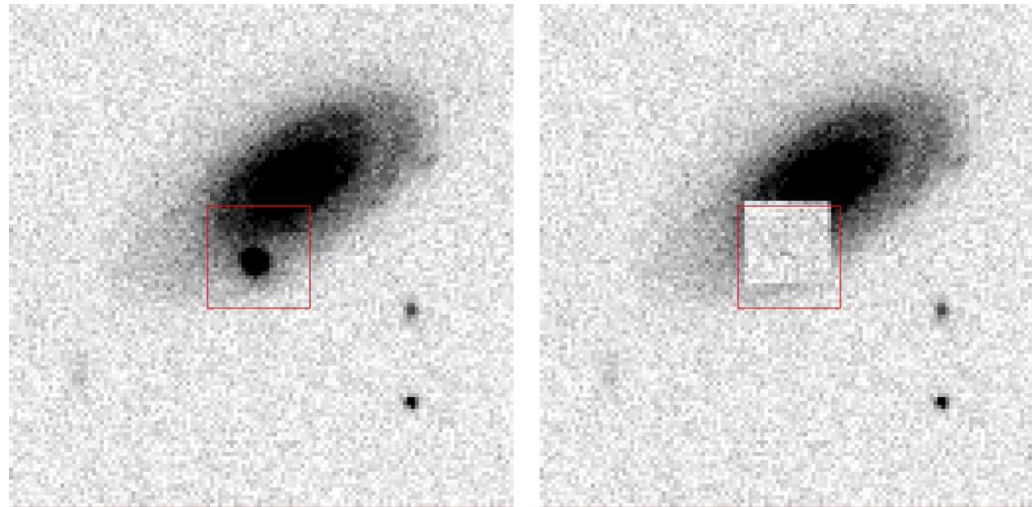
 galaxy pixel model

Flux extraction technique

- ▶ And minimize:

$$\chi^2 = \sum_{xy} \frac{\overset{\text{data}}{O(x, y)} - M(x, y)}{\left(M(x, y)/G + \left(\frac{\sigma_{rn}^2}{G^2} \right) \right)} \leftarrow \text{read noise}$$

- ▶ Fit all frames and bands simultaneously. Galaxy model is constant in time in a given band. SN is fixed in position, but flux is allowed to vary.



- ▶ Code performs better with more pre-SN images.

Tests

- ▶ Stellar photometry -- fit field stars as if they are hostless SN.
- ▶ Pre-SN measurements --
- ▶ Fake SN --